Status of the Muskellunge Fishery
Rice Lake, Barron County, WI 2007
MWBIC Code: (2103900)

By

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Executive Summary

The adult muskellunge population in Rice Lake was sampled during 2007-2008. Muskellunge adult densities (≥ 30.0 in) were low at 0.14 fish/acre in 2007. Although adult densities were low, the number of legal length muskellunge (≥ 40 in) was high at (0.07 fish/acre). Size structure of muskellunge was good with RSD-40 and RSD-45 at 50 and 16, respectively. Muskellunge condition was good with a mean relative weight of 102. Management recommendations consist of implementing a 50 inch length limit for muskellunge and increasing stocking slightly to improve recruitment of muskellunge.

Introduction

Rice Lake is a 939-acre drainage lake with a maximum depth of nineteen feet and a mean depth of nine feet located in eastern Barron County in the city limits of Rice Lake. The Red Cedar River enters and exits Rice Lake. Stump Lake (129 acres, max depth 9 ft) is connected to the northern portion of Rice Lake and Bear Creek enters Stump Lake. Fish movement between the two waters is unrestricted.

Muskellunge management began in Rice Lake in 1987. Muskellunge are not native to Rice Lake or any Barron County lakes (Becker 1983). Rice Lake is a Class A2 muskellunge water (WDNR 1996). The A2 classification is for waters that provide the most consistent angling action, and have the potential to produce some larger fish. The reproductive classification for Rice Lake is a Category 3 muskellunge water. This classification describes waters where natural reproduction of muskellunge is absent and stocking is necessary to provide maintenance of the population (WDNR 1996). Stocking of large fingerling muskellunge ($\geq$ 7 in) in Rice Lake has varied. From 1987-1991 annual stocking of muskellunge occurred at a rate of approximately 1.5 fish/acre. From 1993-1999 stocking occurred during odd numbered years at the same rate but, in 1999 stocking was reduced to approximately 1.0 fish/acre during odd numbered years (Figure 1). Sport fishing regulations for muskellunge since 1998 have consisted of a 40 inch minimum length limit with a daily bag of one fish.

This study was part of a statewide long-term monitoring effort of muskellunge populations in Wisconsin. Specific parameters of muskellunge populations to be monitored include population abundance, size structure and growth. Knowledge of these population parameters allows for responsible management of the muskellunge fishery and sets the foundation for future management of muskellunge in Rice Lake. The objective of this study was to assess the muskellunge population in Rice Lake, and to develop a new management plan for the muskellunge fishery, if necessary.

Methods

Adult muskellunge were captured in two consecutive years using fyke nets (24-h sets) during the spring spawning period (Hanson 1986). Fyke nets had 4 X 6 ft frames with ½"-in bar mesh and leads from 50 to 100 ft. Muskellunge were measured to the nearest 0.1 in (total length) and marked with a fin clip. All muskellunge handled were sexed (when possible) by presence of eggs or milt or by visual inspection of the urogenital pore (LeBeau and Pageau 1989). A subsample of muskellunge was also weighed to the nearest

ounce. No growth information was collected as scale interpretations are often unreliable for accurate age determination of esocids and cleithra require sacrificing fish.

Abundance of adult muskellunge (≥ 30 in) was estimated using Bailey's modification of the Petersen method (Ricker 1975). Muskellunge captured in the first year were marked for recapture in the second year. Several independent estimates were calculated: (1) mature muskellunge of each sex 30 in and greater and (2) mature muskellunge, sexes combined and unknowns, 30.0-33.9 in, 34.0-37.9 in, 38.0 in and greater, and 40.0 in and greater. Number of adult muskellunge 40 in and greater was determined from the proportion of muskellunge 40 in and greater handled in the marking run times the abundance estimate for fish 38 in and greater.

Size structure and condition of muskellunge were determined from spring sampled fish. Relative stock density (RSD) was used to describe population size structure (Anderson and Gutreuter 1983), with 30 in as stock size (Hanson 1986), and relative weight (*W*r; Neumann and Willis 1994) to describe condition of muskellunge. RSD represents the percent of fish larger than the stock length that are larger than a specified length (e.g. RSD-34).

Results

Abundance of adult muskellunge (≥ 30 inches) in 2007 was 134 (CV=0.16) or 0.14 fish/acre (Table 1). Abundance of legal length muskellunge (≥ 40 inches) was 64 or 0.07 fish/acre. Abundance was lower in all length groups < 40 in. For example, abundance of 30.0-33.9 in and 34.0-37.9 in muskellunge was 10 and 30, respectively (Table 1). In comparison, abundance of 38.0+ in muskellunge was 94.

Mean length of male muskellunge was 34.9 in (SD=4.8, Min=26.2, Max=44.2). The mean length of female muskellunge was considerably higher at 42 in (SD=4.3, Min=28.2, Max=49.5).

The length frequency and size distribution of adult muskellunge sampled in 2007-2008 was towards larger size fish (Figure 2). More specifically, RSD-34 values were 85 and RSD-40 and RSD-45 were 50 and 16, respectively.

Adult muskellunge in Rice Lake were in excellent condition in 2007. In 2007, mean relative weight of adult muskellunge was 102. Relative weight by specific length ranges varied but was over 100 for all length ranges sampled (Table 3). Relative weight of large muskellunge (38.0+ in) was also good at 100.

Discussion

Abundance of adult muskellunge in Rice Lake was low. The current population (0.14 fish/acre) was below the mean range (0.36-0.42 fish/acre) reported by Margenau and Avelallemant (2000) for 15 northern Wisconsin lakes. In addition, the size structure of muskellunge is skewed to larger fish. More specifically, the abundance of muskellunge between 30-37.9 inches was only estimated at 40 fish, compared to abundance of muskellunge larger than 38 inches estimated at 94. The reduction in muskellunge stocking over the past decade is likely responsible for the lower number of smaller muskellunge recruiting into the fishery and would explain the high proportion of larger fish . In addition, some muskellunge emigrate out of Rice Lake over the dam and travel downstream into the Red Cedar River further reducing recruitment. The portion of the Red Cedar River downstream of the Rice Lake dam was classified as muskellunge water in 2007 and no stocking had occurred prior to this designation and no downstream waters harbor muskellunge (Benike 2007a). Increasing muskellunge recruitment into Rice Lake should help mitigate downstream recruitment losses and ensure the fishery maintains itself.

Abundance of legal length ($\geq$ 40 in) muskellunge in Rice Lake was good (0.07/acre), however lower than recent estimates on Deer and Bone Lakes in nearby Polk County were muskellunge legal length ($\geq$ 40 in) densities were 0.11 fish/acre. (Benike 2006, Benike 2007b). Larger muskellunge ($\geq$ 47 in) were more common in Rice Lake than Bone and Deer Lakes. Only one muskellunge over 47 inches was captured in Bone Lake and none were captured in Deer Lake. In comparison, three were captured in Rice Lake. Of those three, all were near or over 49 inches in length. It's possible that the low abundance of muskellunge in Rice Lake has allowed for better growth than Deer and Bone lakes, where adult muskellunge density is considered high. However, without any growth information this hypothesis cannot be substantiated.

The 40-inch minimum length limit initiated in 1998 has provided protection to muskellunge < 40 in and likely led to the development of a quality fishery in Rice Lake. However, considering Rice Lake's demonstrated ability to produce large trophy class muskellunge approaching 50 inches, a regulation change should be considered to maximize this trophy potential. Margenau and Petchenik (2004) noted that while nearly all muskellunge anglers felt a muskellunge needed to be at least 40 in to be considered a trophy, 62% felt a trophy needed to be longer than 50 in during a 1999 survey, considerably higher than 44% in a similar survey conducted in 1989. Increasing expectations for larger muskellunge is likely a product of

angling experience, as more and more anglers catch fish longer than 40 in, they look to the next length barrier (45, 48, then 50 in).

Relative weight of muskellunge in Rice Lake was good suggesting an adequate forage base. Assuming densities remain low, increasing the minimum length limit should not negatively impact fish condition and should ensure that a trophy muskellunge fishery is maintained.

Summary and Management Recommendations

1. The Department should reclassify Rice Lake as a Class A1 muskellunge water and manage Rice Lake for a low density trophy muskellunge fishery.
2. The minimum length for muskellunge should be increased to 50 inches with a daily bag limit of one fish. This regulation change will ensure that a low density population will be maintained and muskellunge will be allowed to reach their ultimate length.
3. The adult muskellunge population ($\geq$ 30 in) should remain at a density of < 0.20 fish/acre. Abundance objectives for large muskellunge ($\geq$ 40) should be 0.10 fish/acre, while RSD-45 should remain at or above 10 and RSD-50 should be increased to 1.
4. Muskellunge stocking should be increased to 1.5 fingerlings/acre or 1,409 fingerlings on an alternate year basis. This management strategy provides a slight increase in recruitment and is more comparable to historic stocking rates. Because of the difficulties of determining growth rates of muskellunge, stocked fingerlings should be finclipped. In addition, the use of PIT tags to track individual growth histories should be explored. Marking stocked muskellunge would also help monitor emigration of fish into the Red Cedar River.

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Table 1. Abundance estimate of adult muskellunge by sex and length-group for Rice Lake, Barron County. Coefficient of variation (CV = 100 X SD/mean) is in parenthesis.

	Sex		Length-group (in)			
Year	Male	Female	30-33.9	34-37.9	≥38.0	≥40.0
2007	56 (0.22)	87 (0.23)	10 (0.35)	30 (0.45)	94 (0.18)	64 (.17)

Table 2. Mean (SE) total lengths (inches) of adult muskellunge sampled with fyke nets in Rice Lake, Barron County, Wisconsin.

Year	Male	Female	Combined
2007	34.9 (0.70)	42.0 (0.60)	38.0 (0.63)

Table 3. Mean relative weight by select length groups and total mean relative weight for adult muskellunge. Rice Lake, Barron County, Wisconsin. Whole numbers centered below means are sample size.

Year	30.0-33.9	34.0-37.9	38.0+	Total
2007	100	118	100	102
	(2)	(5)	(28)	(35)

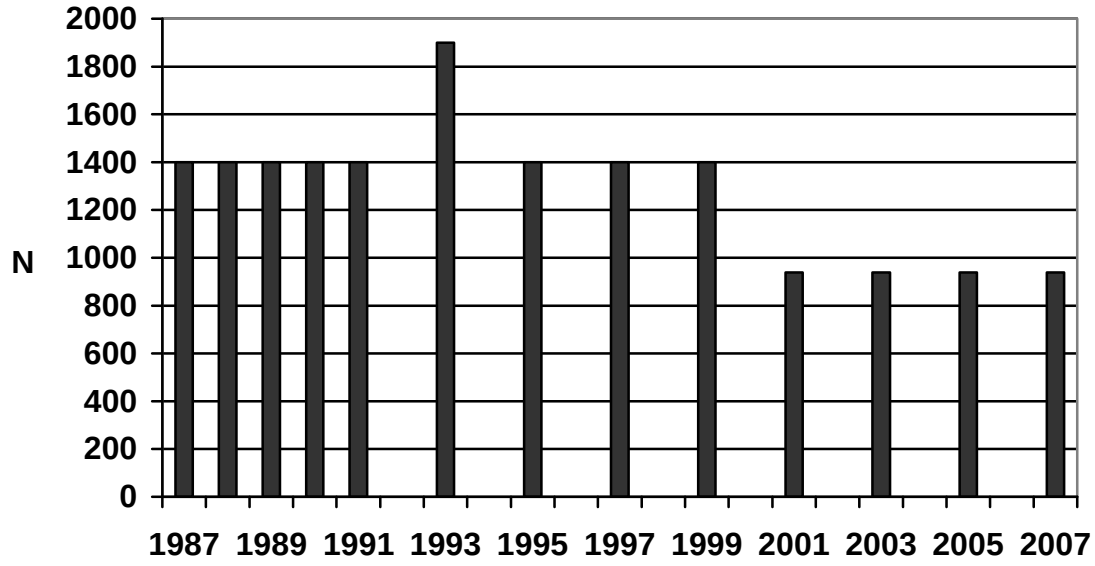

Figure 1. Large fingerling (≥ 7in) muskellunge stocking in Rice Lake, Barron County, Wisconsin 1987-2007.

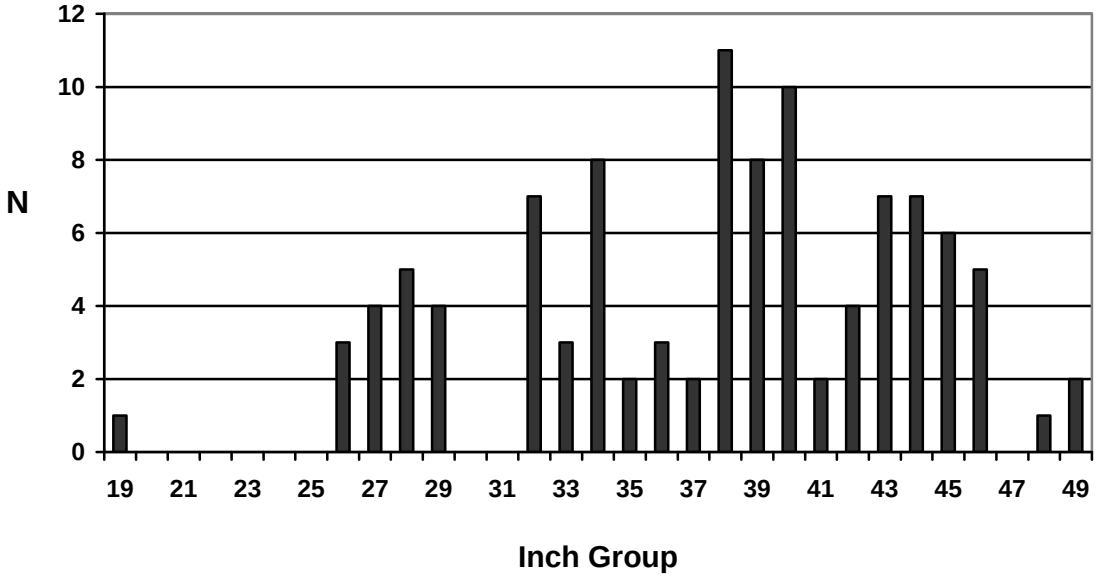

Figure 2. Length frequency distribution of muskellunge in Rice Lake, Barron County, 2007-2008 (N = 105).